IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of: Marc SABOURIN

Application No.: 08/907,687 | Examiner: M. Alvo #35/3-3

Filing Date: August 8, 1997 | Group Art Unit: 1731

For: **Method of Pre-treating Lignocellulose Fiber Containing Material for the Pulp Making Process**

Commissioner for Patents
Washington, DC 20231

Sir:

APPLICANT'S BRIEF

In furtherance of the Second Notice of Appeal filed November 21, 2002, for the subject application, Applicant hereby files this Brief, in triplicate, along with a check in the amount of $ 320.00.

Mailing Receipt

I hereby certify that this correspondence is being deposited on the date given below with the United States Postal Service ~~as first~~ class mail in an envelope addressed to "Commissioner for Patents, Washington, DC 20231."

Date: January 21, 2003

L. James Ristas, Reg. No. 28,663

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(1) REAL PARTY IN INTEREST

The real party is the assignee, Andritz Inc., formerly an Ohio corporation and now a Delaware corporation.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

(3) STATUS OF CLAIMS

Eighteen (18) claims are presented for appeal, consisting of independent claim 29, independent claim 31 with associated dependent claims 2, 7, 23, 25, 26, 27, 32, 33-35, and independent claim 36 with associated dependent claims 24 and 37-40. All claims 2, 7, 23-27, 29, and 31-40 stand rejected per the Official Action dated August 28, 2002. At least independent claim 31 stands twice rejected, as set forth in the Notice of Appeal.

(4) STATUS OF AMENDMENTS

No amendments have been filed subsequent to the claims as examined and rejected in the Official Action dated August 28, 2002.

(5) SUMMARY OF THE INVENTION

The following summary is derived from the specification, but is augmented for clarity by reference to numbered paragraphs in the April 10, 2002, Declaration* of inventor Marc Sabourin.

The present application is directed only to a method for producing thermo-mechanical pulp (TMP). In this regard, each of the independent claims requires three distinct operations: (1) pretreatment by conditioning and compressing the feed material

* This asterisk and others appearing in this Brief indicate that the respective document may be found among the enclosures to the Response to Final Action dated April 11, 2002, filed with the (first) Notice of Appeal.

at particular environmental conditions, (2) preheating the pretreated material, and (3) refining the preheated material. These three distinct operations, and examples of associated conditions, are disclosed in the specification on page 3, line 25 and Fig. 1* pretreatment at 15-25 psi in conditioning component 3 and compressing component 6 of Fig. 1); page 12, line 5 (preheating at a temperature above Tg in preheat system 15 of Fig. 1); and page 12, line 5 (refiner 10 of Fig. 1). (Decl. Par. 3-4)

"Pretreatment" as described and claimed by applicant, is very different from "preheating". These are performed in different chambers, at different environmental conditions. In particular, the specification from page 11 at line 22 through page 12 line 6, read in conjunction with the figures, discloses different pressure/temperature conditions, separated by pressure plugs upstream of 11 and 19, between the pretreatment and preheating. On page 14, line 30, a higher pressure of the preheating relative to the pretreatment is described with reference to the pressure plug formed by 88 as shown in Figure 3. In the RTS type of TMP refining process, the pressure/temperature environment in both the preheating and refining components is higher, preferably by at least 10 deg. C, than Tg. The RTS is the subject of incorporated U.S. Patent Application No. 08/736,366, now U.S. Patent Application No. 5,776,305. The document incorporated by reference discloses a pressure range of 75-95 psi for preheating and refining with RTS. Such document also discloses the steam pressure range of conventional TMP refining, as 30-55 psi (which also represents conventional TMP preheating).

In the context of mechanical refining, in particular TMP production, the invention would be utilized upstream of the conventional pre-heating vessel, from which pre-heated chips are fed into the refiner *per se.* For example, in applicant's Figure 1, the inventive pre-treatment is embodied in the combination of components 3 and 6, which are upstream of the preheating components 20,22 and the refiner components 30,32. Similarly in Figure 2, the inventive pre-treatment is embodied primarily in the components 52 and 6, which are upstream of the preheating components 20,22 and

refiner components 30,32. In the embodiments of Figures 1 and 2, the pre-treated material is temporarily stored in a bin 14 at atmospheric pressure, before being conveyed to the preheating components. The embodiment depicted in Figure 3* likewise shows the inventive pre-treatment embodied primarily in components 74,80, upstream of the pre-heating components 20,22 and refiner components 30,32, with direct discharge from the pre-treating components to the pre- heating components.

Particularly in the combination with the so-called RTS- TMP process according to which the preheating of the feed material in components 20,22 is performed at a temperature above Tg for a short time period of e.g., under 20 seconds, before direct introduction into a high speed disc refiner 32, applicant's invention has shown significant energy improvement without loss of quality.

Thus, ample support appears in the specification for the claim recitations to the effect that the preheating operation is distinct from the pretreatment operation, with the preheat steam pressure being different from, and preferably greater than, the pretreatment steam pressure.

The conditioning at elevated temperature and pressure and compression at elevated temperature and pressure produce a synergistic effect such that the fibers, although destructured, remain pliable, i.e., they do not become so friable as to crumble when rubbed between the thumb and forefinger. (Decl. Par. 4)

(6) ISSUES

Claims 29, 2, 23-26, 31, 32, and 34 are rejected under 35 USC §103(a) based on the disclosures of Cederquist (et. al.) with or without Prusas (et.al.) or EP 0034560 or Minton.

Claims 7, 27, 33, and 35-37 are rejected under 35 USC §103(a) based on the disclosures of Cederquist with or without Prusas or Minton (as applied to claim 29) further in view of EP 0034560.

Claims 38-[sic] 450 (assumed to be 38-40) are rejected under 35 USC §103(a)

based on the disclosures of Cederquist with or without Prusas or Minton (as applied to claim 29) further in view of Lunan (et. al.).

(7) GROUPING OF CLAIMS

Independent claim 29 stands alone.

Independent claim 31differs from claim 29, *inter alia*, in reciting that the fibers are destructured "without significant breakage across grain boundaries", that the preheating is "at a pressure higher than the pressure of the environment at which the material was destructured", and that the pre-heated material is conveyed to the inlet of a "primary disc refiner". Claims 2, 7, 25, 26, 27, 32, and 33 will for purposes of appeal be grouped with claim 31, without prejudice to relying on the respective recitations for patentably distinguishing applicant's invention should other prior art or other issues arise in the USPTO or elsewhere.

Claim 23, which depends from claim 31, recites, *inter alia,* an intervening conveyance and storage of the destructured material at atmospheric pressure, before conveyance through a pressure barrier to a higher pressure environment where the preheating is performed.

Claims 34 and 35, which depend from claim 31, recite, *inter alia,* that the compressing is performed in a variable speed compression screw device, which can control the conditioning time period in the range of 3-30 seconds.

Independent claim 36 differs from the other independent claims, *inter alia,* in that the conditioning occurs in a first chamber at an elevated pressure in the range of about 10-25 psi, the compression occurs in a second chamber at an elevated pressure in the range of about 10-25 psi, preheating occurs in a third chamber at a pressure above 75 psi for less than 30 seconds, and the refining is at higher than conventional speeds.

Claim 24, which depends from claim 36, recites an intervening conveyance and storage of the destructured material at atmospheric pressure, before conveyance through a pressure barrier to a higher pressure environment where the preheating is

performed.

Claims 37-40, which depend through independent claim 36, recite quantitative ranges for certain process variables. These are grouped together for purposes of appeal, without prejudice to relying on the respective recitations for patentably distinguishing applicant's invention should other prior art or other issues arise in the USPTO or elsewhere.

(8) ARGUMENT FOR REVERSING THE REJECTIONS

Applicant believes all grounds for rejection should be reversed. This application has been prosecuted for some time, the examiner appears to understand the invention and the prior art, but the examiner insists on ascribing absolute pressure to applicant's units of "psi", despite strong evidence that "psi" as used by practitioners in this field refers to gage pressure rather than absolute pressure. Applicant has clearly committed to the meaning of "psi". If the Board agrees with applicant's position on this issue, (i.e., that "psi" refers to gage pressure), then all grounds for rejection on the basis of prior art become moot.

Each of the independent claims clearly recites that the feed material is in the form of chips, thereby precluding pulp as a feed material. The pressure unit "psi" is employed uniformly, and for reasons explained more fully below, should be understood as referring to gage pressure, not absolute pressure.

A. Summary of Main Points

1. The legal requirements under 35 USC §112 specify, *inter alia*, that the specification (i.e., abstract, description and claims collectively) shall (a) contain a written description of the claimed invention that enables any person skilled in the relevant field, to make and use the claimed invention, and (b) set forth the best mode for carrying out the claimed invention.

2. It is a further legal requirement under 35 USC §112 that the specification shall conclude with claims that particularly point out and distinctly claim the invention.

3. As a result of these legal requirements, the claims are directed to practitioners in a specific field; in this instance, the field of commercial thermo-mechanical pulping.

4. The present specification described (a) both TMP and chemical digestion embodiments of the invention, (b) broad ranges of process conditions for each embodiment, and (c) preferred process conditioned for each embodiment. However, the content of the specification describing chemical pulping does not broaden the skill and knowledge of the relevant hypothetical person of ordinary skill beyond the field of mechanical pulping, because chemical pulping is not claimed.

5. The terminology and units employed by practitioners in the field of mechanical pulping have been established by the inventor's Declaration and examples of technical and conference papers in the field of TMP.

6. While the claims are limited to TMP, and thus the level of skill and knowledge and the prior art should be so limited, the adequacy of the disclosure for complying with the requirements of 35 USC§112 should be viewed in the context of what a person of ordinary skill in the field of TMP, would learn about the claimed invention, from the "blue-print" provided by applicant in the entire specifications. while realizing that the specification describes all of (a), (b), and (c) of point 4.

7. As to point 4 (b), there can be no doubt that the description enables any person skilled in the relevant field of mechanical refining, to make and use the claimed invention as committed to by applicant. Such person would learn that pretreatment

before preheating and refining, comprises steaming at saturated steam conditions above atmospheric pressure, followed by high compression in a saturated steam environment above atmospheric pressure. The original independent method claim presented by applicant recited the feature of "elevated pressure", which to one of ordinary skill in this field necessarily means above atmospheric, and this point has thereafter been consistently argued.

8. As to point 4 (c) any person skilled in the relevant field of mechanical refining would learn that for the process condition that is most easily controlled, i.e., pressure, the magnitude should be at least about 10 psi but not high enough to produce significant darkening of the lignin, and preferably in the range of 15-25 psi.

9. Although no units were given beyond "psi", and upon initial reading one might be prompted to look more closely at the broadest temperature range of 90–150 deg. C and the broadest steam saturation pressure range of 10-50 psi, such closer inspection would undoubtedly conclude that the "psi" must be "psig".

10. The Examples in the specification provide the only disclosure of a specific pressure and associated specific temperature. Thus, if 22 psi corresponds to 128 deg. C, in an Example, and the saturation temperature at 22 psig is 128 deg. C, then one of ordinary skill would realize that throughout the specification, "psi" means "psig".

11. With this understanding in mind, any person skilled in the relevant field of mechanical refining would conclude that none of the prior art, alone or in combination, discloses or teaches a TMP system or process, having the three steps of (1) pretreatment, (2) preheating, and (3) refining, wherein the saturated steam pretreatment (1) is pressurized above atmospheric, let alone at the claimed pressures in the range of 10-25 psi.

B. **Key Features Recited In the Claims**

Claim 29 specifies distinct pretreatment (conditioning and compressing), preheating, and refining operations. The refining step must immediately follow the preheating step, thereby precluding both spatially and temporally, any distinct intervening processing between preheating and refining, such as chemical digestion. (Applicant's claim does not preclude addition of chemicals during or after pretreatment).

Independent claims 29, 31 and 36 require that the conditioning and compressing be performed in an environment of saturated steam at elevated pressures in the range of 15-25 psi or 10-25 psi, thereby precluding pretreatment at mere atmospheric pressure.

Applicant's independent claim 36 requires that the preheat (after pretreatment) occur at a temperature above T_g and a time of less than 20 seconds, followed by TMP refining at a temperature above T_g and a higher than conventional speed of disc rotation. This corresponds to applicant's RTS-TMP as represented for example in Figure 3. The conditioning portion of the pretreatment is performed at 10-25 psig in a variable speed conveyor 74, and the compression at 81 is also performed in an atmosphere having the same range of pressure. This highly compressed material is directly discharged into the preheater 20, which would typically be operating in the range of 75-95 psi, and likewise the preheated material would be fed into the refiner 32 for refining under the same conditions of 75-95 psi with higher than standard disc rotation speed.

C. **Unresolved Issue Based On Imprecise Description**

1. **The Facts**

In the Preliminary Amendment filed January 10, 2001, applicant emphasized in the remarks, and gave an example in the paper* entitled "Mill Scale Results on TMP Pulping of Southern Pine with Pressurized Chip Pretreatment", that practitioners in the relevant field routinely use "psi" when referring to "psig". Moreover, contrary to the

examiner's assertion, "psi" does not default to "psia", rather "psi" defaults to "psig" and in the exceptional circumstance when absolute pressure is of significance, the unit "psia" would be employed. (Decl. Par. 6-9)

Nevertheless, the range of 10-25 psi and 15-25 psi (gage) appearing in applicant's claims is directly supported by the original specification, even without reliance on the convention that "psi" defaults to "psig" in the relevant field of endeavor. Applicant draws the Board's attention to the following Table (where more precise calculations of values have been made relative to the corresponding table as presented to the examiner):

Table of Pressure/Temperature Conversions

Psi(a)	Psi(g)	Bar	Sat. Temp. (deg. F)	Sat. Temp. (deg. C)	Comments
	7 psi	0.48			Exhibit 5*p.3 col 1
10.0	-4.7		193	89.4	
14.7	0.0	0.0	212	100	
15.0	0.3		213	101	
	6.0	0.41			Exhibit 5* p.3 col 1
24.7	10.0	0.69	240	116	Exhibit 5* p.3 col 1
25.0	10.3	0.71	240	116	
29.7	15.0	1.03	250	121	
	20.6	1.42			Exhibit 5* p.3 col 1
36.7	22.0	1.52	262	128	Spec. Example 1
38.5	23.8	1.64	265	129	
39.2	24.5	1.69	266	130	
39.7	25.0	1.72	267	130	

Moreover, as discussed in the Declaration of Marc Sabourin (Decl. Par. 10-13),

the fact that the temperature corresponding to the upper end of the claimed pressure range (25 psi gage as represented by applicant) is not inconsistent with avoiding excessive thermal darkening reactions. The 120 deg. C. temperature associated with the glass transition temperature of lignin, Tg, is not an absolute threshold above which excessive darkening occurs instantaneously. The transition temperature is typically in the range of 120-135 deg. C. Applicant's Example 1 of the specification and the results shown in the technical paper* on Mill Scale Results, demonstrate the very significant benefits achieved at gage pressures corresponding to temperatures above 120 deg. C.

Accordingly, there is no inconsistency between a pressure range of 10-25 psig (corresponding to a temperature range of about 116-130 deg. C), and the desirability of avoiding thermal darkening reactions, so long as the time at temperature is short or controllable.

Applicant refers to the specification page 17, line 14 through page 21, and line 6. It is clear that the purpose of the discussion and associated Table A, is to show that Example 1 (pretreatment in a 22 psi and 128 deg. C saturated steam environment) produces noteworthy improvement relative to Comparative Example 1 (pretreatment in an atmospheric saturated steam environment). The pressure of 22 psi can only mean 22 psig, because only 22 psig corresponds to the specified saturated temperature of 128 deg. C in Table A. The improvement attributable to the superatmospheric pretreatment environment of Example 1 relative to Comparative Example 1, is set forth starting on page 20, line 24. The significance is also demonstrated by the data and conclusions appearing in the Mill Scale Results paper, and the discussion in the remarks portion of that paper.

Furthermore, the above Table (see "comments" column) contains several data points from that technical paper in which the present inventor was the principle author, showing that when "psi" is used in this field of technology, gage pressure is intended. The inventor, who is a prolific author, assured the examiner during the interview that in the field of pulp and paper technology, all references to pressure in connection with

operation of a plant, are understood by everyone working in this field, as referring to gage pressure. This is because all instrumentation in plants is calibrated to show gage pressure. For this reason, it was not deemed necessary to specifically identify in the specification, that the pressures were gage pressures.

2. The Applicable Law

The United States Court of Appeals for the Federal Circuit (CAFC) has clearly held that the proper interpretation of a claim term must reflect the understanding of the ordinarily skilled practitioner in the field of the invention. In Toro Co. v. White Consolidated Industries Inc., 53 USPQ2d 1065,1067 (CAFC 1999), the court discussed at length the importance of interpreting a technical term used in a patent document as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning. In particular, the court stated that,

> In judicial "claim construction", the court must achieved the same understanding of the patent, as a document whose meaning and scope have legal consequences, as would a person experienced in the technology of the invention. Such a person would not rely solely on a dictionary of general linguistic usage, but would understand the claims in light of the specification and the prior art, guided by the prosecution history and experience in the technologic field. at 1068.

This approach to interpreting terms of a claim was followed in a number of subsequent cases by the same court, including Rexnord Corp. v. Laitram Corp., 60 USPQ2d 1851,1854 (CAFC 2001) and Leggett & Platt Inc. v. Hickory Springs Manufacturing Co., 62 USPQ2d 1267,1269 (CAFC 2002).

The McGraw-Hill Dictionary of Scientific and Technical Terms, (Fourth Edition), defines "pounds per square inch" as, "a unit of pressure equal to the pressure resulting from a force of 1 pound applied uniformly over an area of one square inch", abbreviated

"psi". Separate definitions are provided for "pounds per square inch absolute", abbreviated as "psia", and "pounds per square inch gage", abbreviated as "psig". The examiner cannot reasonably contend that the dictionary definition of "psi" means absolute pressure.

Thus, in the present appeal, applicant is in a stronger position with respect to the interpretation of "psi", than was the patentee in the Toro case cited above. In that case, "Toro and White had each relied on dictionary definitions of the common words 'cover', 'attachment', 'removable', and 'included', each choosing the definitions that favored its position." Toro, supra, at 1067. In this appeal, the examiner cannot make any stronger argument than that the dictionary definition of "psi" is neutral with respect to absolute or gauge pressure. Where, as in the present appeal, there is no inconsistency or incompatibility in the dictionary definition of pounds per square inch, applicant's own definition as clearly established in the record, should be afforded decisive significance.

There can be no question that applicant was in possession of a novel invention according to which chips are conditioned and compressed in an environment of saturated steam at an elevated pressure of e.g., 22 psig as shown in Example 1. The issue to be decided by the Board does not arise from uncertainty as to whether applicant possessed the claimed invention as of the filing date of the application, but only as to the meaning to be ascribed to the quantitative definition of the invention.

Applicant contends that all the factors in the record of the subject patent application that are relevant the interpretation of the term "psi" point to gage pressure, not absolute pressure. The examiner has arbitrarily decided that "psi" in the claims refers to absolute pressure. However, the way in which the term is used in Example 1, the only plausible interpretation consistent with applicant's repeated emphasis on the importance of conditioning steam at an elevated pressure, the way in which the term is used in technical publications, and the inventor's commitment on the prosecution record as to the meaning, cannot be cast aside by the examiner without ignoring the clear direction of the CAFC.

D. The Rejection Based On Prior Art

1. Cedarquist is the Linchpin of All Prior Art Rejections

The rejection of claims 29, 2, 23-26, 31, 32, and 34 is grounded on the combination of Cedarquist with Prusas, EP0034560, or Minton. The rejection of claims 7, 27, 33, and 35-37 is grounded on the combination of Cedarquist with Prusas or Minton, further in view of EP0034560, and the rejection of claim 38 is grounded in the combination of Cedarquist and Prusas or Minton, further in view of Lunan

Thus, all pending claims were finally rejected under 35 USC §103, in reliance on Cedarquist as the basic reference. Cedarquist can serve as a basic reference, only if the examiner's contention that "psi" in applicant's claims, must be interpreted as "psia". Only if applicant's claimed pressure range of 10-25 psi includes pressure at or below atmospheric, can Cedarquist constitute a plausible basic reference, because Cedarquist discloses pretreatment at atmospheric conditions, with no teaching or suggestion of pretreatment at above-atmospheric conditions.

To the extent the rejection of the claims under 35 USC §112 is withdrawn or reversed, all rejections under 35 USC §103 must also be withdrawn or reversed.

At the personal interview among applicant, his attorney, and the examiner, applicant showed the Figure* from the Cederquist patent (U.S. 4,136,831) annotated to indicate the pressure in the various components as described therein. In Cederquist, the material undergoes conventional pre-steaming at atmospheric conditions, in vessel 2. The chips are conveyed via screw 3, while still at atmospheric pressure. While still at atmospheric pressure, the chips are compressed in screw device 4. Throughout the processing of the chips in components 2, 3 and 4, the material not only remains at atmospheric pressure, but the temperature thereof cannot exceed 100 deg. C. Moreover, it should be appreciated that an atmospheric system such as this cannot be operated in a casual manner to develop an overpressure, inasmuch as this would violate safety and code requirements so that a system designed for atmospheric pressure must

remain at atmospheric pressure. Device 4 forms a plug at the discharge, thereby providing a pressure barrier against the higher pressures associated with the bin 6, feeding device 7, and refiner 8, all of which are operated with overpressure corresponding to a temperature range of 130-200 deg. C.

Thus, Cederquist discloses a system having atmospheric pre-steaming at zero psig (certainly, no greater than 14.7 psia) and temperature not exceeding 100 deg. C; conditioning at zero psig and a temperature not exceeding 100 deg. C, followed by compression at zero psig and a temperature not exceeding 100 deg. C, followed by preheating in an environment of saturated steam at a super-atmospheric pressure corresponding to 130-200 deg. saturated steam, followed by refining at super-atmospheric pressure corresponding to a temperature in the range of 130-200 deg. C. Applicant notes that the system of Cederquist is designed for MDF fiberboard in which discoloration is of no consequence, rather than for paper, where discoloration is of great consequence.

The coincidental overlap of the temperature of about 130 deg. C corresponding to the top end of applicant's claimed range of 10-25 or 15-25 psi for <u>pretreatment</u>, with the lower end of the Cedarquist_pressure/temperature range for <u>preheating</u>, is of no significance. Like applicant, Cedarquist discloses a pretreatment followed by preheating, but the clear disclosure of the Cedarquist pretreatment as performed under atmospheric pressure conditions, followed by pretreatment at very high pressure, teaches away from any inference that even the lowest preheat temperature (e.g., 130 deg. C) could be used for pretreatment.

2. The Secondary References

Applicant does not dispute that the secondary references include disclosure of (1) high compression of wood chip material in atmospheric steam, expansion, then feeding to a chemical digestion cooking unit (Prusas); (2) high compression of wood chip material in atmospheric steam, expansion, then feeding into a TMP primary refiner

(EP0034560), and (3) high compression of pulp material in atmospheric steam, before feeding to an atmospheric secondary refiner (Minton). The Board may wish to refer to the inventor's Declaration (Decl. Par. 13-16).

Prusas

Prusas is directed to a chemical pulping configuration as depicted in Figure 4 thereof, which shows wood chips fed at atmospheric conditions from a hopper 10 into a screw press 12 equipped with a plug former for applying a back pressure to the chips as they pass through the press. The press 12 destructures the chips as a result of compression in the ratio of 3/1 to 5/1. The destructured chips are then fed <u>directly</u> into the compartment 16 of a continuous vapor phase <u>digester</u>, whereupon they are conveyed into the main digester tank 20 by feed screw 22. Because the chips are not completely defiberized when they leave the digester, the material is blown from the digester 18 into a disc refiner. The resulting pulp is washed and is further processed in, e.g., an oxygen delignification and bleaching plant (see Prusas col. 8, lines 1-30).

Although Prusas indicates in column 4 beginning at line 41 that it is desirable to expose the chips to steam before destructuring in the screw press 12, Prusas does not specify the steaming conditions. The most common steaming conditions are at or slightly above atmospheric, for an extended period of time, i. e., many minutes. The cited passage also indicates the desirability of operating the screw press or other destructuring means at a temperature above 100°C, such as 120°C -160°C. Although an elevated temperature is disclosed, Prusas does not specifically disclose that the screw press environment is at saturated steam conditions, with a high pressure corresponding to the elevated temperature. Importantly, Prusas does not disclose, suggest or imply that the pre-steaming of the chips should be performed at elevated temperature and pressure conditions in the range of 10 psi – 25 psi (116°C-130°C), or even at the same environment as in the screw press.

Prusas performed a number of experiments according to his invention and stated at col.4, line 50 that, "Chips pre-treated in accordance with the present invention are friable. That is, they can be crumbled by pressing and rolling the chip between the thumb and index finger."

Applicant emphasizes that the specification supports the distinction recited in independent claims 31 and 36, to the effect that the fibers are destructed without significant breakage across grain boundaries. Figure 12 is an electron photomicrograph of a woodchip which has not been conditioned, compressed or otherwise pre-treated. The rigid fiber structure is intact, and there is a lack of separation of the individual softwood fibers along their longitudinal axis. Figure 13 is an electron photomicrograph of a woodchip conditioned and compressed according to the present invention, wherein the chip was exposed to steam heating and pressurization at 22 psi, followed by high compression at 5:1 compression ratio. The micrograph shows a high level of axial separation along the longitudinal axis of the individual softwood fibers. Some surface delamination is also in evidence. Figure 14 is an electron photomicrograph of a wood chip which has been atmospherically pre-steamed, then compressed at a 4:1 compression ratio. A high level of axial separation of fibers is noted in this micrograph, but this is tempered by the large number of fractured fibers. The presence of fibers sheared in the compression step is also noted. Some sheared fibers appear in the lower central region of the micrograph. They are identified by the somewhat flattened "0" shape of the sheared end of the fiber.

EP0034560

It is clear from the description that the steaming bin 10 is at atmospheric conditions, with steam at 100 deg. C introduced therein via distribution line 13. The inlet to the screw press unit 15, is also at atmospheric pressure, so the high compression is also performed at atmospheric pressure. The highly compressed material forms a plug in the annulus surrounding bearing portion 25. This plug maintains a pressure

separation between the refiner pressure of 20-30 psi, and atmospheric. The screw flights 32 on the high pressure side are specifically provided to pull apart the previously compressed material. Therefor, there is no teaching or suggestion of pretreatment of chips at high compression in a saturated steam environment in the range of 10-25 psi.

Minton

Minton is of little relevance, because it is directed to pretreatment of pulp, not wood chips. Pulp for paper making can be produced from wood chips entirely by one or more series of mechanical refiners (e.g., to produce TMP pulp), or by digestion or cooking processes (chemical pulp). Sometimes chemical pulp is further processed by mechanical refining, as a finishing step before bleaching. This is exemplified by Minton, where the process for producing pulp from chips by cooking (e.g, see column 1, line 68 to column 2, line 4) is discussed as a background step to the claimed processing of such pulp to produce the desired "kinks" in the <u>pulp</u>. According to the Declaration of Marc Sabourin a screw press operating even at a high compression ratio of 8:1, could not produce permanent twists and kinks in the fibers of wood <u>chips</u>. (Decl. Par. 17)

Lunan

Lunan relates to <u>preheating</u> of the chip material prior to introduction directly into a <u>disc refiner</u>. Applicant's preheating (e.g., as in 20,22 of applicant's Figure 1) is different from and performed following applicant's claimed pre-treatment. In Lunan (as with applicant's preferred TMP and RTS - TMP), the high pressure for preheating is the same as that which occurs in the device which achieves the pulping, i.e., the refiner. However, Lunan teaches nothing about pretreatment.

The Combination of Prusas and Lunan

Prusas relates to chip treatment upstream of a chemical digestion system; there is no teaching or suggestion of the applicability to thermo-mechanical refining. Lunan

relates only to thermo-mechanical refining. In chemical pulping such as in Prusas, the pre-steaming is never directly exposed to the high pressure and temperature conditions of the pulping device, i.e., digester, and it is improper for the examiner to select a characteristic inherent to mechanical refining and arbitrarily attribute a similar characteristic for a non-analogous component or function in a chemical pulping process. The optional refiner of Prusas following the digester is a low pressure, finishing refiner that is fundamentally different from and cannot be used for generating thermo-mechanical pulp. In Lunan the high pressure conditions upstream of the refiner are for preheating (at 32-90 psi) and not for the pretreatment upstream of preheating. Applicant's claims that specify a pressure range of 15 -25 psi further distinguish Lunan.

E. Objective Evidence Of Invention In The Specification

Applicant refers the Board to applicant's discussion in the Supplemental Response to Final Action, filed April 23, 2002, concerning In re Glaug, 62 USPQ2d 1151, 1154 (CAFC 2002), in which the CAFC held that data in a patent specification should have been considered as evidence of non-obviousness because it was offered as illustrative of an advantageous property of the claimed invention.

Applicant's Figure 14 represents the type of destructured chip which results from the high compression of atmospherically pre-steamed chips as described in the Prusas patent and the nature of the resulting partially destructured chip is consistent with the description of Prusas quoted above. In contrast, Figure 13 which reflects a woodchip conditioned at elevated pressure and temperature before destructuring to an even higher compression ratio than that associated with Figure 14, shows the superiority of destructuring without significant breakage across grain boundaries, relative to what one of ordinary skill would derive from Prusas.

Furthermore, applicant provides several examples of the improved performance of TMP and RTS-TMP depending on the use of chips processed according to the invention. In Example 1, woodchips were pre-treated according to the invention as

subjected to a saturated steam atmosphere at 22 psi at 128°C for a period of six seconds, then subjected to compression at a ratio of 5/1, The woodchips were fed to a pressurized single disc refiner operating under RTS conditions. In Comparative Example 1, the woodchips were exposed to steam under ambient conditions for a period of 25 minutes, then compressed at a ratio of 4:1. In Comparative Example 2, there was no pre-treatment. As shown in Table A, the performance of Example 1, demonstrates improved strength properties and a significant reduction in the specific energy required to produce pulp of the same freeness. (Decl. Par. 5)

F. Other Objective Evidence Of Invention

In further support of patentability, applicant again refers to the technical paper* entitled "Mill Scale Results on TMP Pulping of Southern Pine with Pressurized Chip Pretreatment", the principal author of which is the present inventor, Marc Sabourin. Page 6 of the paper identifies references 4, 5 and 6 as prior papers authored by Mr. Sabourin, regarding laboratory or pilot plant studies demonstrating the improvements achieved with the compressive pretreatment according to the present invention. Exhibit 5 presents results of the invention as implemented in a full size, large papermill, operated by one of the largest paper manufacturers in the United States. Applicant has highlighted with vertical lines, those portions of the paper which are particularly pertinent. The paper presents the results of the pretreatment system in the mill starting in July 1999. Exhibit 5 includes as page 7, an annotated version of the system schematic embedded in column 1 on page 2 of the technical paper. This system is implemented in the RTS-TMP refining line at the mill.

The favorable conclusions are summarized on page 6 of the paper. These are based on the summary tables appearing on pages 8 and 9 of the paper. Applicant notes that the wood chip feed material properties can vary seasonally, and therefore one set of data represent so-called winterwood (Table IV), and the other represent summerwood (Table VI). As the text clearly demonstrates in the lower half of column 1 on page 3, the

pressure designation of "psi", as related to equivalent "bar", necessarily refers to psig, without need for explanation, because the reader would understand this to be the case. Tables IV and VI have been annotated to include the English unit pressure for the corresponding "bar" units, for ready reference. In Table IV, the "bypass" condition means that the pretreatment according to the present invention (i.e., conditioning and compression) was not performed at all. The column indicating zero psi refers to conditioning and compression at atmospheric conditions, i.e., such as shown in the Cederquist patent.

The results of implementing applicant's invention were not only favorable in a full size mill operated by one of the country's largest paper company, but the results were so noteworthy as to merit the presentation in a technical paper at a major pulp and paper conference.

Thus, the Mill Scale Results paper from Bowater provides support for the invention as limited to TMP. The paper shows (1) equivalents for pressure units of bar and psi as indicative of gage pressure, not absolute (e.g., 1.0 bar = 15 psi as per page 3 col. 1, and (2) the numerous advantages of the RT Pressafiner pretreatment from satisfying the stated objective of "sufficiently partially defibrating the pine tracheids (fibers) such that the number of compressive (refining) cycles necessary to liberate the fibers is reduced". Figs. 4, 5, and 6 are discussed in this respect.

CONCLUSION

1. The examiner's basic reference for a TMP refining system (Cedarquist) does not disclose, teach, or suggest pressurized pretreatment upstream of pressurized preheating.

2. The chips as processed by Prusas for chemical pulping easily crumble between the

3. Unlike fingers, i.e., they are not pliable;

4. the processed chips of Prusas, the chips as pretreated by applicant's invention have a high degree of fiber separation yet remain pliable ;

5. Applicant's pretreatment and associated TMP processing provide superior results relative to conventional TMP;

6. There is insufficient basis for the examiner to combine the teachings of Cedarquist (TMP) and Prusas (chemical pulping) and Lunan (TMP) to reject applicant's claims to a TMP process, by looking to the tertiary reference Lunan to supply the missing nexus between Cedarqist and Prusas.

7. For the foregoing reasons, applicant requests that the Board reverse the examiner on all stated grounds for rejection.

Respectfully submitted,
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APPENDIX - COPY OF CLAIMS ON APPEAL

2. The method as claimed in 31, wherein said compression is performed in a compression screw device in a range of from 4:1 to 8:1 of the non-compressed volume of said conditioned feed material.

7. The method as claimed in claim 2, wherein said conditioning of said feed material is performed for a period of time in the range of 3-180 seconds.

23. The method of claim 31, wherein the step of preheating is preceded by the steps of

discharging the destructured material into a conveyer at substantially atmospheric pressure;

conveying the discharged material into a storage bin at substantially atmospheric pressure; and

conveying material from the bin by a plug screw feeder through a pressure barrier into a higher pressure environment where said step of preheating is performed.

24. The method of claim 36, wherein the step of preheating is preceded by the steps of

discharging the destructured material into a conveyer at substantially atmospheric pressure;

conveying the discharged material into a storage bin at substantially atmospheric pressure; and

conveying material from the bin by a plug screw feeder through a pressure barrier in to the higher pressure environment where said step of preheating is performed.

25. The method of claim 31, wherein the steps of conditioning and

compressing are both performed in a substantially similar environment of saturated steam.

26. The method of claim 31, wherein said saturated steam environment for conditioning and compression is at a saturated pressure corresponding to a temperature no greater than about 120° C and the steps of preheating and conveying the destructured material are performed at a saturated pressure corresponding to a temperature greater than about 120° C.

27. The method of claim 26, wherein the conditioning of said feed material is performed for a period of time in the range of 3-60 seconds.

29. A method for producing thermo-mechanical pulp from lignocellulose fiber-containing chip feed material comprising the steps of:

first conditioning said fiber containing feed material in an environment of saturated steam at a pressure in the range of about 15-25 psi to produce a conditioned feed material;

subsequently compressing said conditioned feed material in a screw press in an environment of saturated steam at a pressure in the range of about 15-25 psi at a compression ratio of at least about 4:1 to destructure said fibers;

subsequent to the step of compressing, preheating the destructured material in an environment of saturated steam; and

immediately following the step of preheating, refining said material to form lignocellulose pulp.

31. A method for producing thermo-mechanical pulp in a primary disc refiner from lignocellulose fiber-containing chip feed material comprising the steps of:

first conditioning said fiber-containing feed material in an environment of

saturated steam at an elevated pressure in the range of about 15-25 psi to produce a conditioned feed material;

directly thereafter compressing said conditioned feed material in an environment of saturated steam at an elevated pressure in the range of about 15-25 psi to destructure said fibers without significant breakage across grain boundaries;

pre-heating the destructed material in an environment of saturated steam at a pressure higher than the pressure of the environment at which the material was destructured; and

conveying the pre-heated material to the inlet of a primary disc refiner operating at a higher pressure than the pressure of the environment at which the material was destructured.

32. The method of claim 27, wherein said compression is performed in a compression screw device in the range of from 4:1 to 8:1 of the non compressed volume of said conditioned feed material.

33. The method of claim 31, wherein the conditioning of said feed material is performed for a period of time in the range of 3-60 seconds.

34. The method of claim 31, wherein said step of compressing said conditioned feed material is performed in a variable speed compression screw device in the range of from 4:1 to 8:1 of the non compressed volume of said conditioned feed material.

35. The method of claim 34, wherein the conditioning of said feed material is performed for a period of time in the range of 3-30 seconds.

36. A method for producing thermo-mechanical pulp in a primary disc refiner

from lignocellulose fiber-containing chip feed material comprising the steps of:

first conditioning said fiber containing feed material while conveyed through a first chamber having an environment of saturated steam at an elevated pressure in the range of about 10-25 psi to produce conditioned feed material;

conveying and compressing the conditioned feed material through a second chamber having an environment of saturated steam at elevated pressure in the range of about 10-25 psi to produce a pretreated material having destructured fibers without significant breakage across grain boundaries;

preheating the pretreated material in a third chamber in an environment of saturated steam at a pressure above 75 psi and above the glass transition temperature of the lignin in the material, for a period of time less than 30 seconds;

conveying the pre-heated material to the inlet of a primary disc refiner operating at a pressure above 75 psi and a temperature above the glass transition temperature of the lignin; and

refining the material at a disc speed of rotation that is greater than 1500 rpm for a double disc refiner or greater than 1800 rpm for a single disc refiner.

37. The method of claim 36, wherein the conditioning of said feed material is performed for a period of time in the range of 3-60 seconds.

38. The method of claim 37, wherein the preheat time period is in the range of about 5-10 seconds.

39. The method of claim 36, wherein the preheat time period is 15 seconds or less.

40. The method of claim 39, wherein the conditioning of said feed material is performed for a period of time in the range of 3-60 seconds.